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(54) **IMAGE DISPLAYING METHOD AND DISPLAY USING THE SAME**

(75) Inventors: **Chih-Ming Chang**, Taoyuan County (TW); **Sheng-Ke Lin**, Taoyuan County (TW); **Yen-Lung Lin**, Taipei County (TW)

(73) Assignee: **AU Optronics Corporation**, Hsinchu (TW)

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H04N 5/46 (2006.01)

(52) **U.S. Cl.** **348/555**

(58) **Field of Classification Search** 348/555, 348/552–554, 558, 705, 730, 725, 571, 575, 348/706, 569
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,754,082	A *	5/1998	Swanson	333/124
5,808,693	A *	9/1998	Yamashita et al.	348/554
7,298,424	B2 *	11/2007	Oh	348/706
7,812,889	B2 *	10/2010	Chien et al.	348/569
7,825,987	B2 *	11/2010	Yui et al.	348/554
2001/0043286	A1 *	11/2001	Hsieh et al.	348/705
2002/0105229	A1 *	8/2002	Tanaka et al.	307/29
2002/0167610	A1	11/2002	Oh	
2006/0109384	A1 *	5/2006	Miller-Smith et al.	348/730
2007/0126930	A1 *	6/2007	Jang	348/558
2007/0153132	A1 *	7/2007	Jong	348/705
2007/0241990	A1 *	10/2007	Smith et al.	345/5

FOREIGN PATENT DOCUMENTS

CN	1358022	7/2002
EP	1 467 375	10/2004
TW	I231686	4/2005
TW	200516978	5/2005
TW	I246852	1/2006
TW	200608279	3/2006
WO	WO 02/058390	7/2002

OTHER PUBLICATIONS

English abstract of CN1358022.
English language translation of abstract of TW I231686 (published Apr. 21, 2005).
English language translation of abstract of TW 200516978 (published May 16, 2005).
English language translation of abstract of TW I246852 (published Jan. 1, 2006).
English language translation of abstract of TW 200608279 (published Mar. 1, 2006).
English language translation of abstract of TW 200303513.

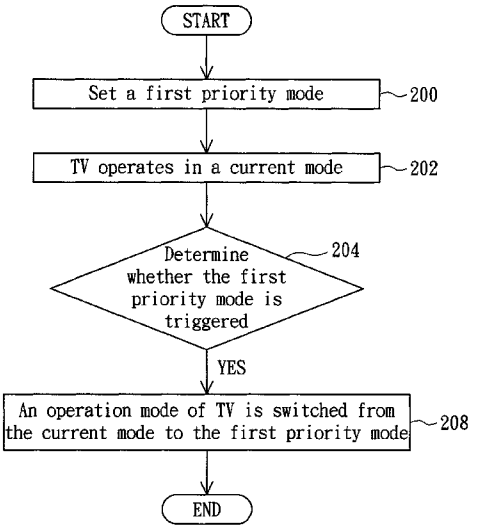
* cited by examiner

Primary Examiner — Paulos Natnael
(74) *Attorney, Agent, or Firm* — Thomas|Kayden

(57) **ABSTRACT**

A method of controlling a display device selectively displaying one of a first signal received from a first signal source and a second signal received from a second signal source is provided. The method includes the steps of: displaying the second signal; detecting whether the first signal is received; and displaying the first signal when the first signal is received by the display device.

10 Claims, 8 Drawing Sheets



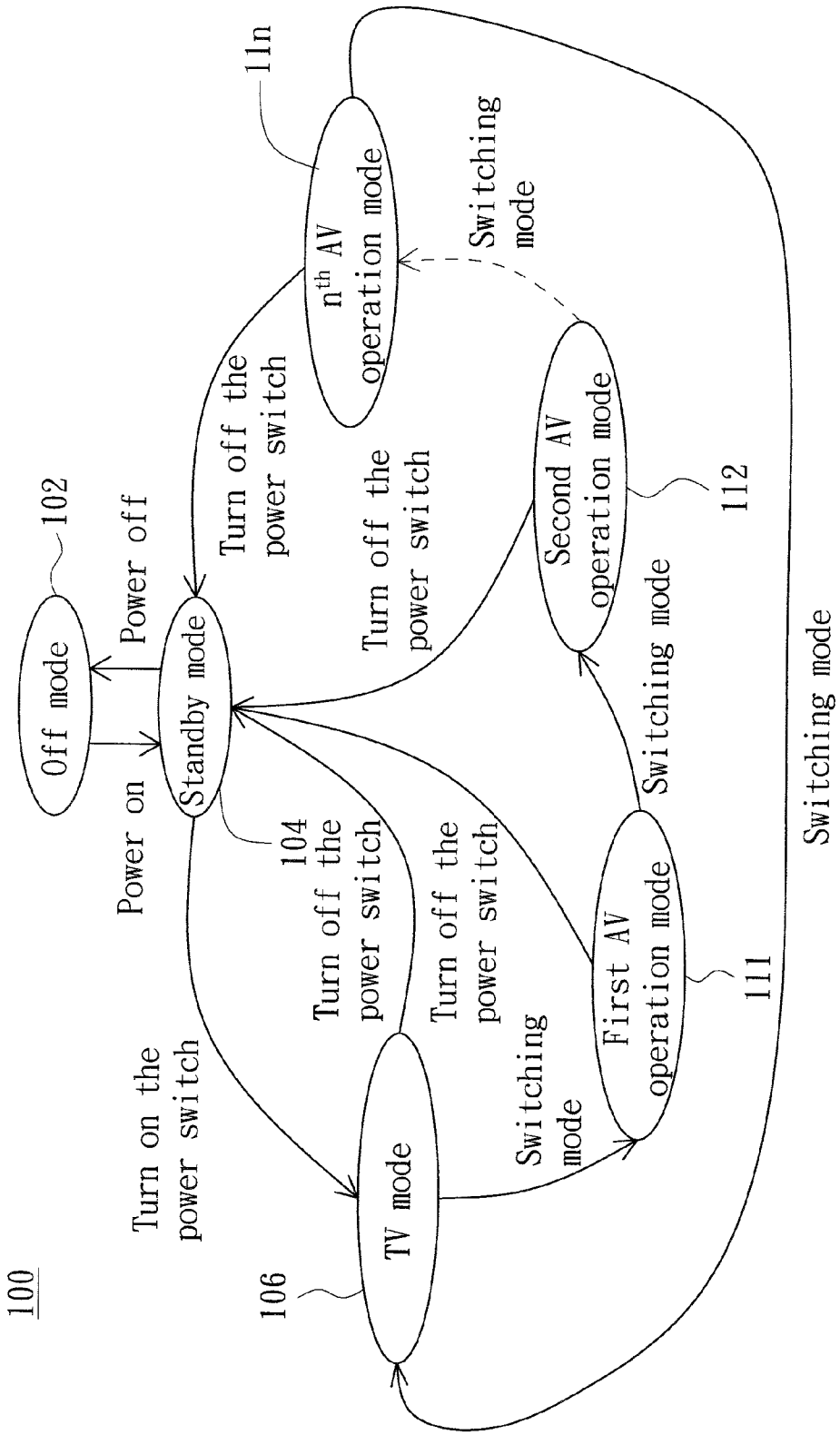


FIG. 1(PRIOR ART)

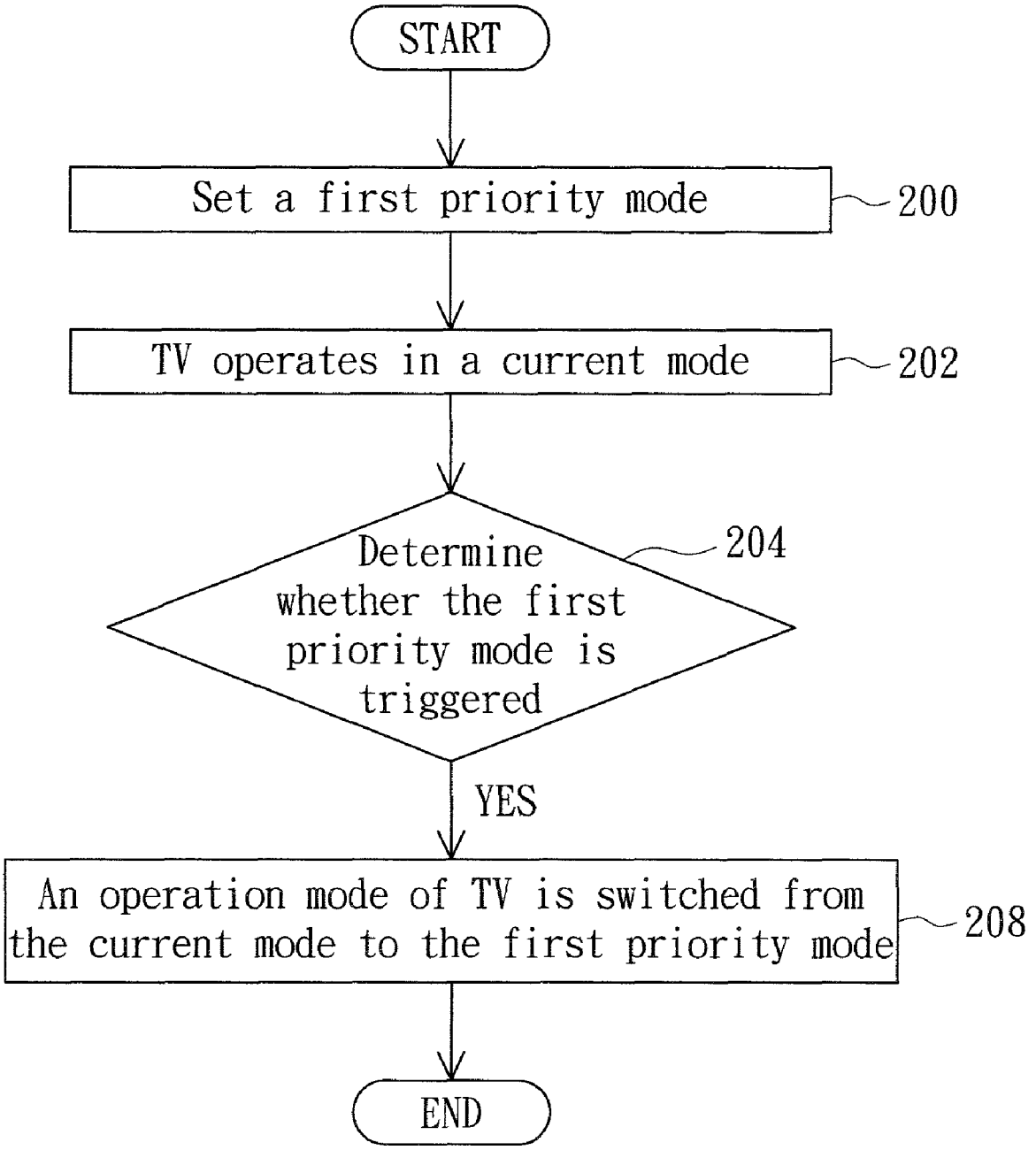

START
Set a first priority mode
200
TV operates in a current mode
202
Determine whether the first priority mode is triggered
204
YES
An operation mode of TV is switched from the current mode to the first priority mode
208
END

FIG. 2

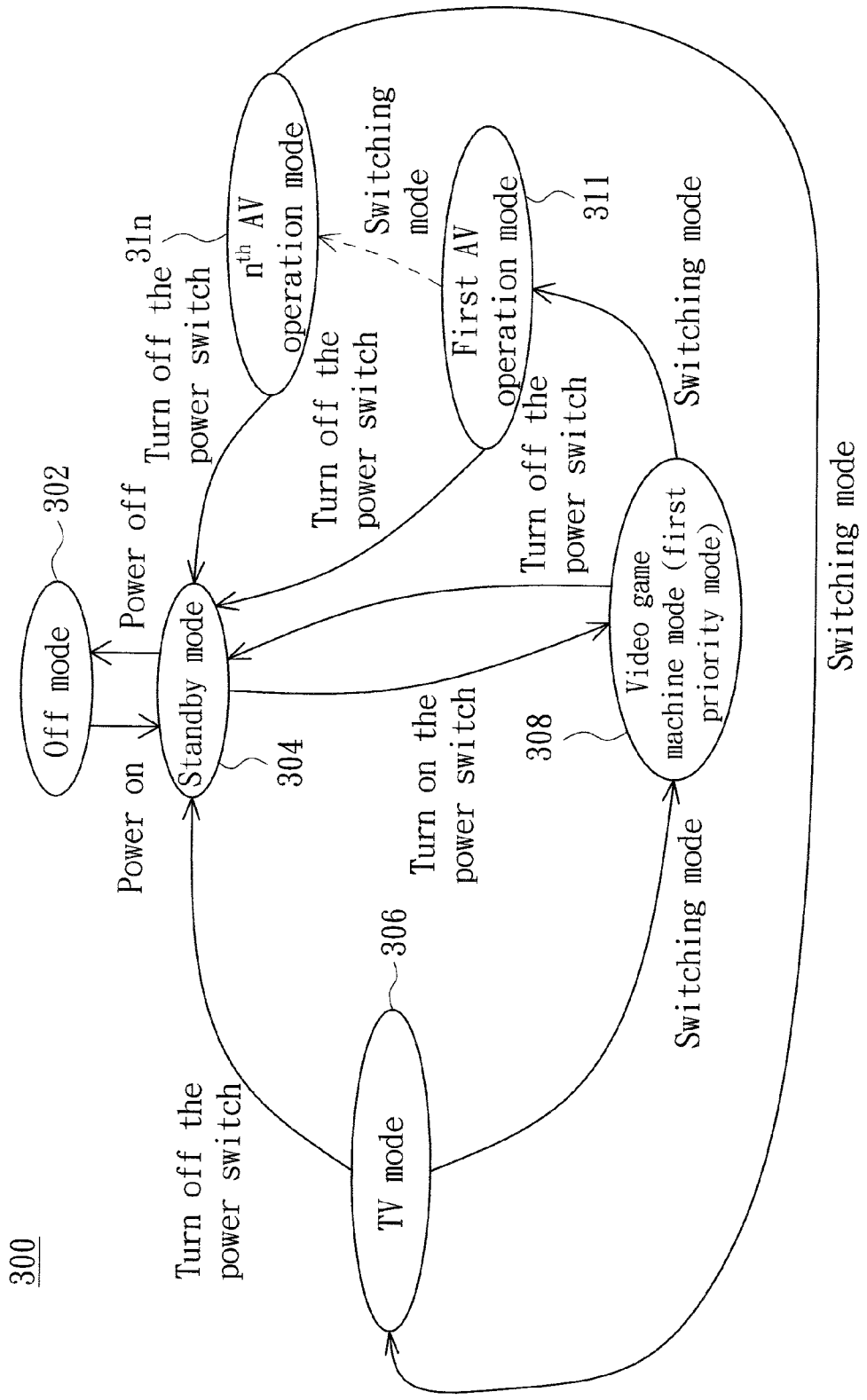

300
Off mode
302
Standby mode
304
TV mode
306
Video game machine mode (first priority mode)
308
First AV operation mode
311
nth AV operation mode
31n
Power off
Power on
Turn off the power switch
Turn on the power switch
Switching mode
Switching mode
Switching mode
Switching mode
Turn off the power switch
Turn off the power switch
Turn off the power switch

FIG. 3

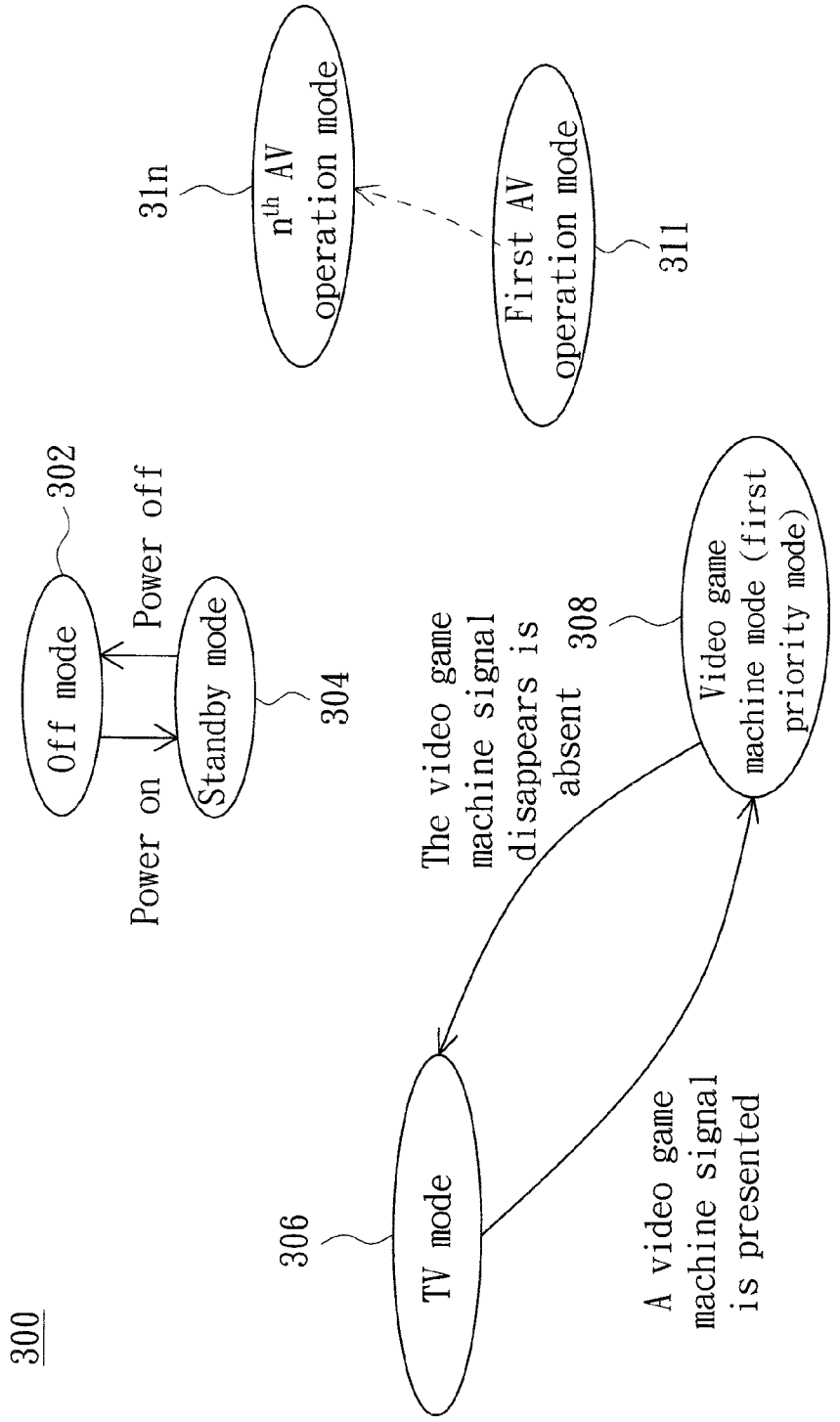

300
Off mode
302
Power on
Power off
Standby mode
304
TV mode
306
The video game machine signal disappears is absent
308
A video game machine signal is presented
Video game machine mode (first priority mode)
First AV operation mode
311
31n
nth AV operation mode

FIG. 4A

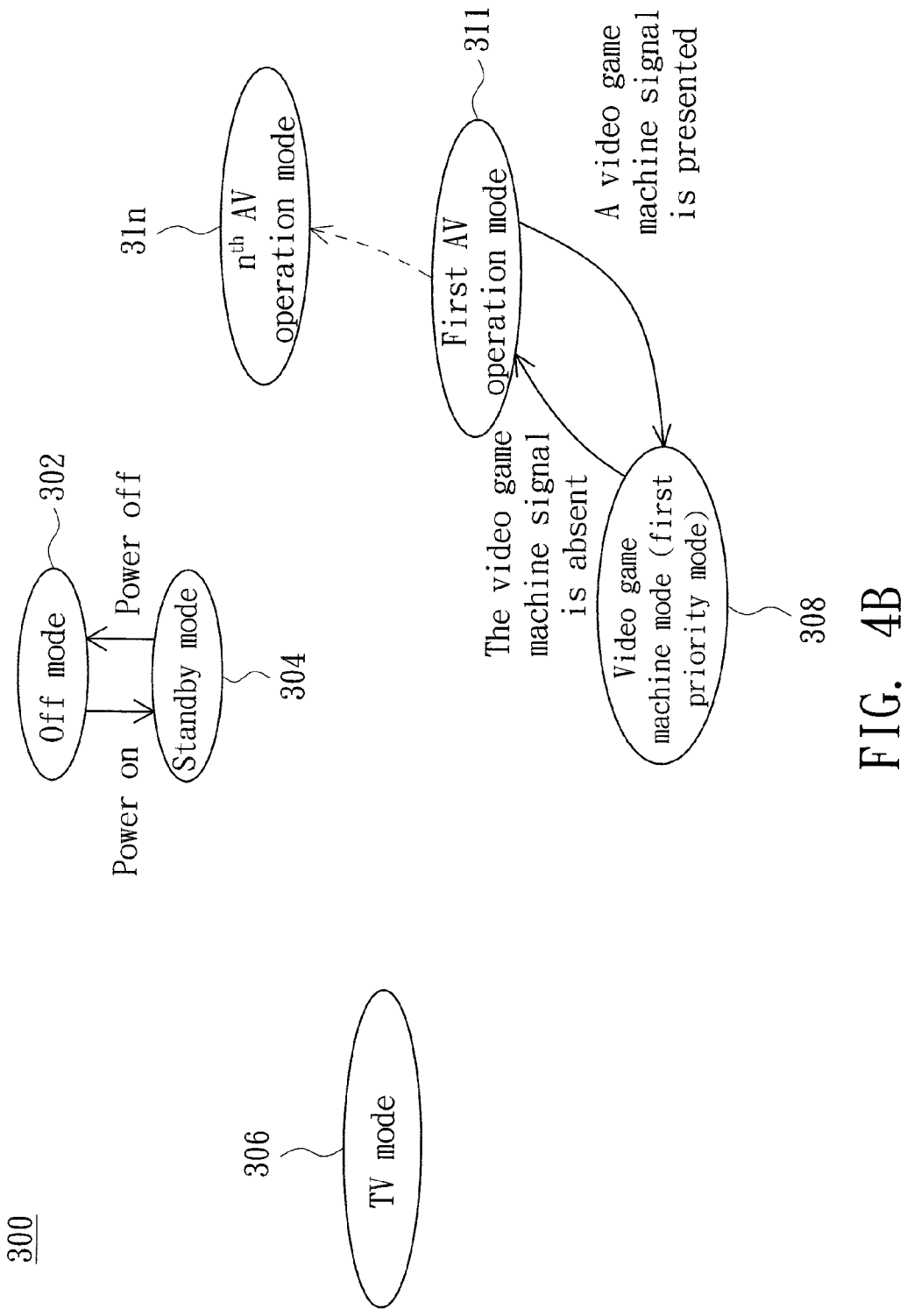

300
306
TV mode
Off mode
302
Power on
Power off
Standby mode
304
31n
nth AV operation mode
First AV operation mode
311
The video game machine signal is absent
A video game machine signal is presented
Video game machine mode (first priority mode)
308

FIG. 4B

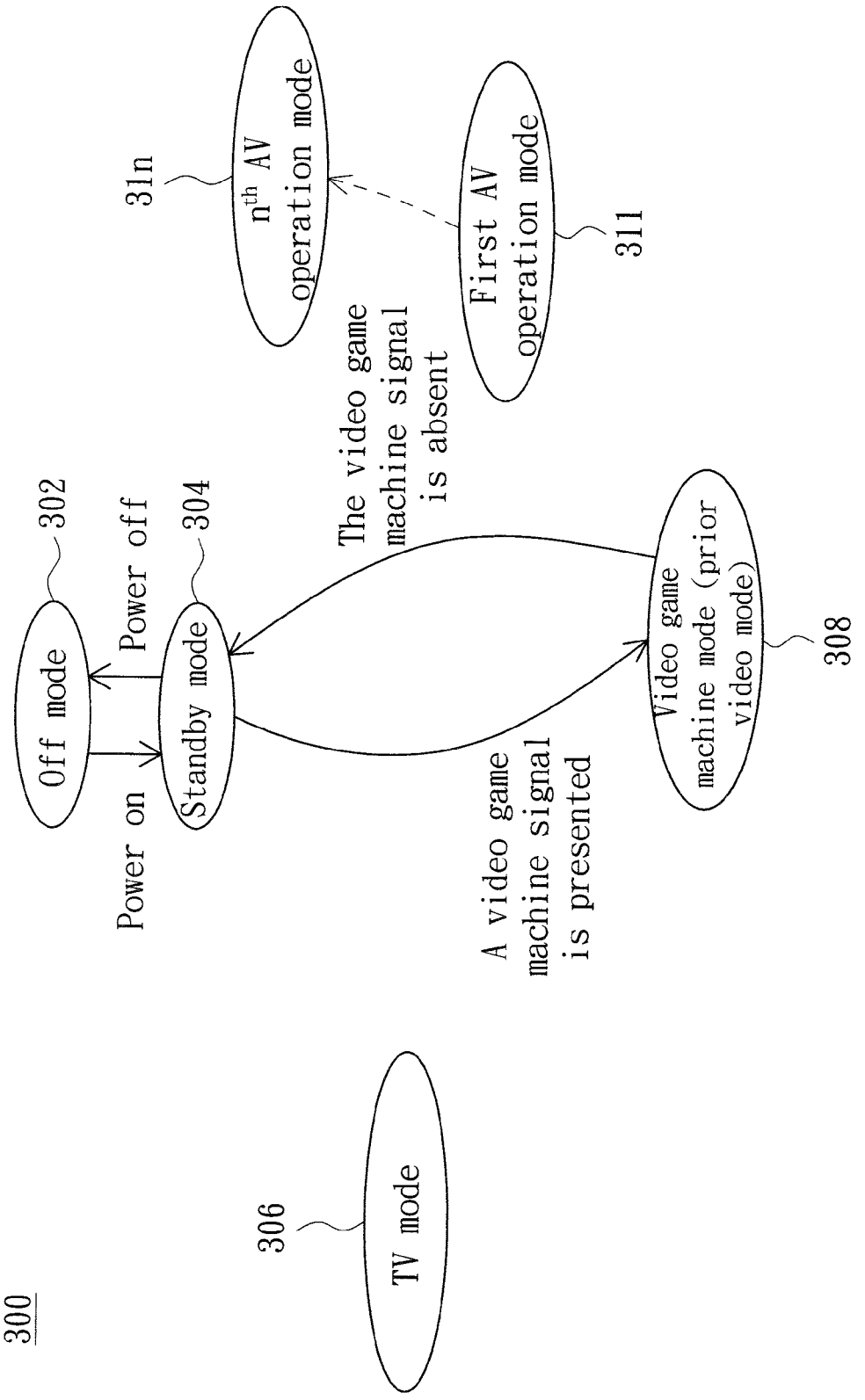

300
TV mode
306
Off mode
302
Standby mode
304
Power on
Power off
A video game machine signal is presented
Video game machine mode (prior video mode)
308
The video game machine signal is absent
First AV operation mode
311
nth AV operation mode
31n

FIG. 4C

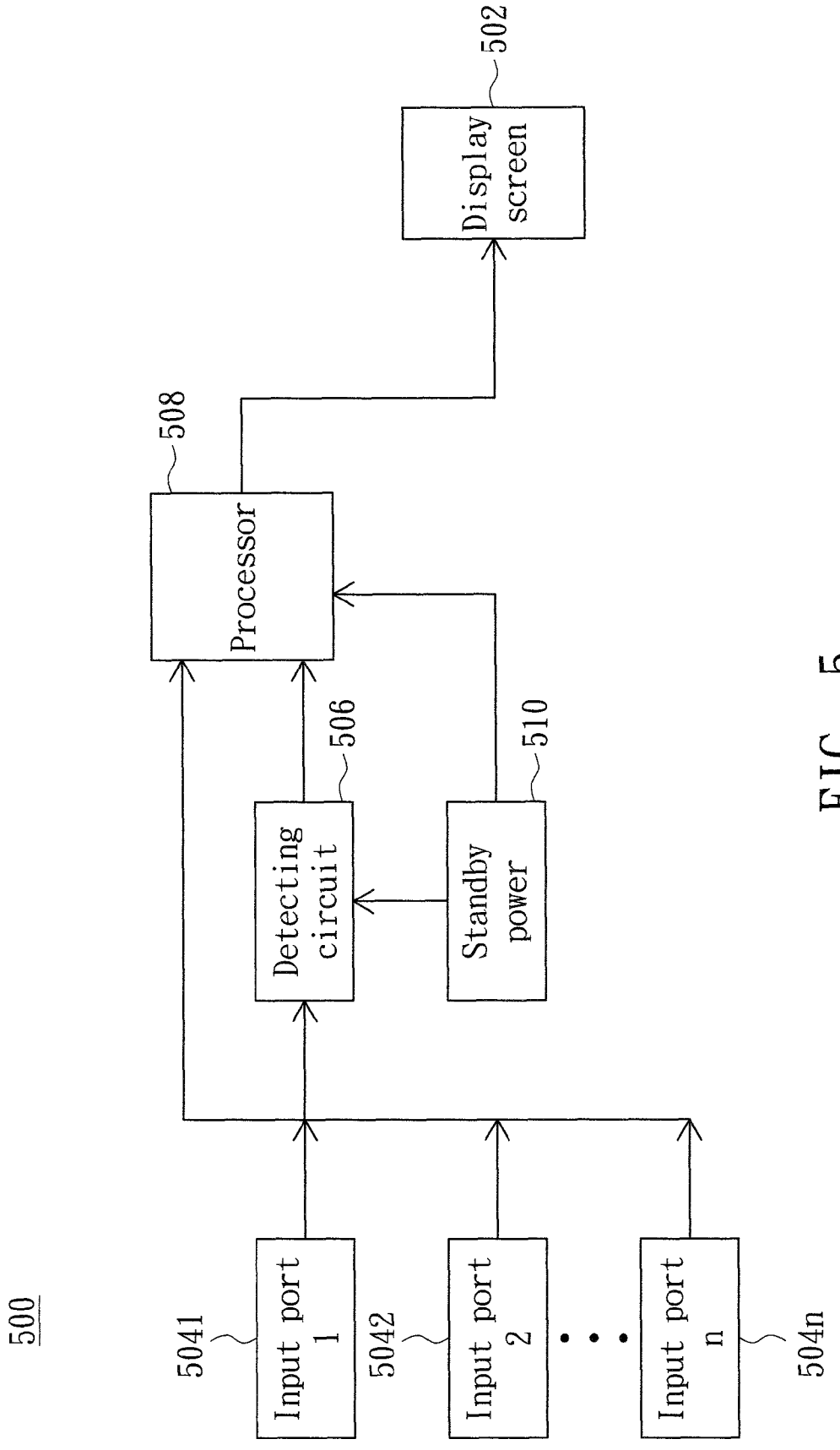

500
5041
Input port 1
5042
Input port 2
Input port n
504n
Detecting circuit
506
Standby power
510
Processor
508
Display screen
502

FIG. 5

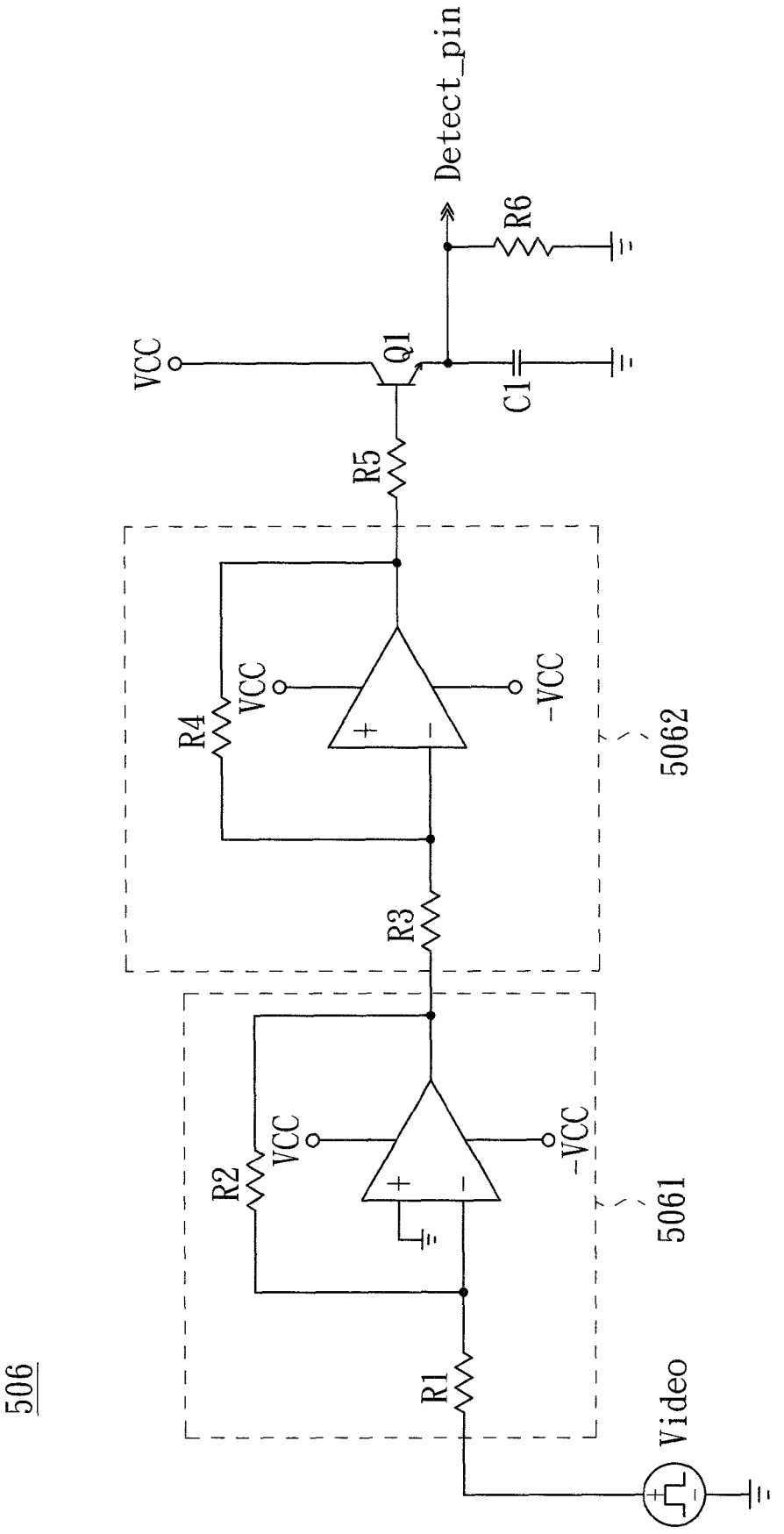

Detect_pin
R6
VCC
Q1
C1
R5
R4
VCC
-VCC
5062
R3
R2
VCC
-VCC
5061
R1
Video
506

FIG. 6

IMAGE DISPLAYING METHOD AND DISPLAY USING THE SAME

This application claims the benefit of Taiwan application Serial No. 95124903, filed Jul. 7, 2006, the subject matter of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates in general to an image displaying method and a display device using the method, and more particularly to an image displaying method and a display device using the method with the high convenience.

2. Description of the Related Art

Video entertainment has occupied an indispensable position in the life of the modern human beings, and a display device, such as a television, is an indispensable element. In general, audio and video interfaces are provided at a front end or a lateral end of the television so that the consumer can perform the easy installation. After the consumer has installed a peripheral audio-video (AV) apparatus, such as a video game machine or a DVD drive, the television and the video game machine are respectively turned on, and then an input port is selected by switching the channel. Thus, the frame of the peripheral AV signal source can be represented on the frame of the television.

FIG. **1** (Prior Art) is a state diagram showing operation mode switching of a conventional television **100**. Referring to FIG. **1**, the television **100** has multiple operation modes, such as an off mode **102**, a standby mode **104**, a TV mode **106**, a first AV operation mode **111** and second to n^{th} AV operation modes **112** to **11***n*. The television **100** is usually in the off mode **102**, in which the television **100** is not powered on yet. After the television **100** is powered on, the television **100** is in the standby mode **104**.

When the user turns on the power switch, the television has a chance to be in the TV mode **106**. Then, the input port may be selected by switching the channel, and the operation mode of the television may be sequentially switched to the first AV operation mode **111** to the n^{th} AV operation mode **11***n*, or from the n^{th} AV operation mode **11***n* to the TV mode **106**. The first AV operation mode **111** to the n^{th} AV operation mode **11***n* respectively correspond to the different peripheral AV signal sources, such as a DVD drive or a video game machine. Either the television **100** is in the TV mode **106** or one of the first AV operation mode **111** to the n^{th} AV operation mode **11***n*, the television **100** goes back to the standby mode **104** when the user turns off the power switch. The television **100** is in the off mode **102** after it is powered off.

However, the peripheral AV signal source, such as the video game machine, is frequently used at home by users, wherein most of the users are kids. The kids usually do not understand how to select the operation mode of the television, and thus need the help of the adults in selecting the correct operation mode so that the AV operation mode corresponding to the used peripheral AV signal source may be selected. Consequently, the selection of the operation mode may bring the trouble to the adults for a long time, and the convenience in use is also deteriorated.

SUMMARY OF THE INVENTION

The invention is directed to an image displaying method and a display device using the same, wherein hardware and software are combined so that an operation mode of a television is switched from a current mode to a first priority mode when the first priority mode of the television is triggered. Thus, the television displays an image corresponding to the first priority mode and the convenience in use can be enhanced.

According to a first aspect of the present invention, a television capable to be operated in a plurality of operation modes comprising a first priority mode is provided. The television is connected to a plurality of signal sources. The television includes a screen, a plurality of input ports, a detecting circuit and a processor. The input ports respectively connect to the plurality of signal sources, and one of the input ports is corresponding to the first priority mode. The detecting circuit detects whether a first signal is received at the input port corresponding to the first priority mode. When the first signal is received at the input port corresponding to the first priority mode, the television is triggered to operate in the first priority mode. The processor displays the first signal on the screen when the television is in the first priority mode.

According to a second aspect of the present invention, a method of controlling a display device selectively displaying one of a first signal received from a first signal source and a second signal received from a second signal source is provided. The method includes the steps of: displaying the second signal; detecting whether the first signal is received; and displaying the first signal when the first signal is received by the display device.

According to a third aspect of the present invention, a display device is provided. The display device includes a screen, a first input port, a second input port, a detecting circuit and a processor. The first input port receives a first signal from a first signal source. The second input port receives a second signal from a second signal source. The detecting circuit detects whether the first signal is presented at the first input port. The processor selectively controls one of the first signal and the second signal to be displayed on the screen. When the detecting circuit determines the first signal is presented at the first input port, the processor displays the first signal on the screen. When the detecting circuit determines the first signal is absent from the first input port, the processor displays the second signal on the screen.

According to a fourth aspect of the present invention, a method of controlling a display device is further provided. The display device is capable to be operated in a standby mode or a turn-on mode, receives a first signal from a first signal source. The method includes the steps of: setting the display device to operate in the standby mode; detecting whether the first signal is received; and setting the display device to operate in the turn-on mode and displaying the first signal when the first signal is received by the display device.

According to a fifth aspect of the present invention, a display device is provided. The display device includes a screen, an input port, a detecting circuit, a processor and a standby power circuit. The input port receives a first signal from a first signal source. The detecting circuit detects whether the first signal is presented at the input port. The processor selectively controls the display device to be operated in one of a standby mode and a turn-on mode. The processor controls the display device to be operated in the turn-on mode and displays the first signal on the screen when the detecting circuit determines that the first signal is presented at the input port. The processor controls the display device to be operated in the standby mode when the detecting circuit determines the first signal is absent at the input port.

The invention will become apparent from the following detailed description of the preferred but non-limiting embodiments. The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** (Prior Art) is a state diagram showing operation mode switching of a conventional television.

FIG. **2** is a flow chart showing an image displaying method applied to a television according to a preferred embodiment of the invention.

FIG. **3** is a state diagram showing operation mode switching of the television according to the preferred embodiment of the invention.

FIG. **4**A is a state diagram showing an example of the operation mode switching of the television according to the preferred embodiment of the invention.

FIG. **4**B is a state diagram showing another example of the operation mode switching of the television according to the preferred embodiment of the invention.

FIG. **4**C is a state diagram showing still another example of the operation mode switching of the television according to the preferred embodiment of the invention.

FIG. **5** is a block diagram showing the television having a first priority mode according to the preferred embodiment of the invention.

FIG. **6** is a circuit diagram showing an example of a detecting circuit **506** according to the preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention provides an image displaying method and a display device using the same, wherein hardware and software are combined so that an operation mode of a television is switched from a current mode to a first priority mode when the first priority mode of the television is triggered. Thus, the television displays an image corresponding to the first priority mode and the convenience in use can be enhanced.

FIG. **2** is a flow chart showing an image displaying method applied to a television according to a preferred embodiment of the invention. As shown in FIG. **2**, the television usually has many operation modes including, for example, an off mode, a standby mode and a turn-on mode. The turn-on mode includes, for example, a TV mode, a game mode or many audio-video (AV) operation modes.

First, in step **200**, the user sets one of the operation modes as a first priority mode. Of course, this first priority mode may also be set as one of the operation modes when the television is shipped out. Then, in step **202**, the television operates in a current mode, which is one of the operation modes. Next, in step **204**, the television has a chance to determine whether the first priority mode is triggered. For example, when the television receives a video signal corresponding to the first priority mode, the television has a chance to determine whether the first priority mode is triggered. If the first priority mode is triggered, the operation mode of the television is switched from the current mode to the first priority mode in step **208** so that the television displays an image corresponding to the first priority mode.

FIG. **3** is a state diagram showing operation mode switching of a television **300** according to the preferred embodiment of the invention. As shown in FIG. **3**, the television **300** individually receives a television signal from a television signal source, receives a video signal, which is outputted after a video game machine is turned on, from the video game machine, and receives many video signals from the AV signal sources. The television **300** has an off mode **302**, a standby mode **304**, a TV mode **306**, a game mode **308** and many AV operation modes **31***x* (x=1 to n). The television **300** displays the television signal, the video signal outputted after the video game machine is turned on and the video signals in the TV mode **306**, the game mode **308** and the AV operation modes, respectively. In this illustrated embodiment, the game mode **308** is set as the first priority mode. When the television **300** is not connected to an external power, such as the mains, the television **300** is in the off mode **302**. When the television **300** is connected to the external power and the video signal outputted from the video game machine does not exist, the television **300** is in the standby mode **304**. After the user turns on the power switch, the television **300** enters the turn-on mode, and the television **300** may be set, in advance, as directly entering the first priority mode (e.g., the game mode **308**) or staying in the last mode before the user shuts down the television **300**.

If the television **300** receives the video signal of the first priority mode, which is outputted after the video game machine is turned on, that is, when the television **300** determines that the video signal outputted after the video game machine is turned on exists, the television **300** determines that the first priority mode is triggered. No matter which one of the standby mode **304**, the TV mode **306** and the AV operation modes **31***x* (x=1 to n) is entered by the television **300**, the television **300** immediately switches to the game mode **308** so as to display the image corresponding to the video signal outputted from the video game machine after the video game machine is turned on without requesting the user to operate the television **300** again. Thus, the user can start to operate the video game machine and view the operation result on the television **300**.

When the user wants to switch the operation mode to another mode, he or she can switch the operation mode of the television **300** to one of the AV operation modes **31***x* (x=1 to n), to the standby mode **304**, to the TV mode **306** and then back to the game mode **308** sequentially by switching the channel. In addition, when the video game machine is powered off, the television **300** determines whether the video signal, which is outputted after the video game machine boots, is absent and then goes back to the previous current mode, such as the standby mode **304**, the TV mode **306**, or one of the AV operation modes **31***x* (x=1 to n).

Three examples for mode switching will be illustrated in detailed in the following. FIG. **4**A is a state diagram showing an example of the operation mode switching of the television according to the preferred embodiment of the invention. As shown in FIG. **4**A, when the television **300** is set as the TV mode and receives the television signal from the television signal source, the user may watch the television program. At this time, if the television **300** determines that the video signal outputted after the video game machine is turned on exists, the first priority mode is triggered and the television **300** automatically switches to the game mode **308** so as to display the video signal after the video game machine is turned on without the channel selecting operation being made by the user. When the television **300** determines that the video signal after the video game machine is turned on is absent, the television **300** goes back to the TV mode **306** and displays the image corresponding to the television signal.

FIG. **4**B is a state diagram showing another example of the operation mode switching of the television according to the preferred embodiment of the invention. As shown in FIG. **4**B, when the television **300** is set as the first AV operation mode and receives the video signal from the audio-video (AV) signal source, the user may watch a film played by the first AV signal source, such as the film outputted from a VCD player or a DVD player. At this time, if the television **300** determines that the video signal outputted after the video game machine is turned on exists, the first priority mode is triggered and the

television **300** automatically switches to the game mode **308** so as to display the video signal outputted after the video game machine is turned on without the channel selecting operation being made by the user. When the television **300** determines that the video signal outputted after the video game machine is turned on is absent, the television **300** goes back to the first AV operation mode **311** and displays the video signal.

FIG. **4**C is a state diagram showing still another example of the operation mode switching of the television according to the preferred embodiment of the invention. As shown in FIG. **4**C, when the television **300** is set as the standby mode **304** and the television **300** determines that the video signal outputted after the video game machine is turned on exists, the first priority mode is triggered and the television **300** automatically operates in the turn-on mode so as to display the video signal outputted after the video game machine is turned on without the channel selecting operation being made by the user. When the television **300** determines that the video signal outputted after the video game machine is turned on is absent, the television **300** goes back to the standby mode **304**.

In the above-mentioned embodiment, the first priority mode is illustrated by taking the game mode **308** as a non-restrictive example, and any other mode may also be set as the first priority mode.

FIG. **5** is a block diagram showing a television **500** having a first priority mode according to the preferred embodiment of the invention. Referring to FIG. **5**, the television **500** includes a display screen **502**, input ports **504***x* (x=1 to n), a detecting circuit **506** and a processor **508**. The input ports **504***x* (x=1 to n) respectively receive the video signals, which are respectively outputted from the AV signal sources corresponding to these operation modes. For example, the input ports **504***x* (x=1 to n) respectively receive the video signal outputted after the video game machine is turned on from the video game machine, receive the television signal from the television signal source or receive the corresponding video signals from the AV signal sources.

The detecting circuit **506** detects whether the AV signal source corresponding to the first priority mode outputs the video signal. When the television **500** receives the video signal corresponding to the first priority mode, the detecting circuit **506** determines that the video signal corresponding to the first priority mode exists, and the first priority mode of the television **500** is triggered. The processor **508** can selectively control one of the video signal, the television signal and the video signal outputted after the video game machine is turned on to be displayed on the display screen. When the first priority mode is triggered, the processor **508** outputs the video signal corresponding to the first priority mode to the display screen **502**. When the television **500** cannot receive the video signal corresponding to the first priority mode any longer, the detecting circuit **506** determines that the video signal corresponding to the first priority mode is absent, and the processor **508** outputs the video signal corresponding to the current mode to the display screen **502**. The television **500** further includes a standby power circuit **510** for supplying a standby power to the detecting circuit **506** and the processor **508** when the television **500** is in the standby mode.

FIG. **6** is a circuit diagram showing an example of the detecting circuit **506** according to the preferred embodiment of the invention. As shown in FIG. **6**, when the television **500** receives the video signal Video corresponding to the first priority mode, a transistor Q**1** turns on through the cooperation of a first inverting amplifier **5061** and a second inverting amplifier **5062**. After a predetermined period of time, a capacitor C**1** is boosted to a fixed voltage so that the transistor Q**1** outputs a high-level processor waking signal Detect_pin to trigger the processor **508** and make the processor **508** output the video signal corresponding to the first priority mode to the display screen **502** so that the video signal can be displayed on the frame of the television **500** preferentially.

The embodiment of the invention is illustrated by taking the television as an example, and may also be applied to other displays without restricting the scope of the television.

In the image displaying method and the display using the same according to the invention, the hardware and software are combined so that the operation mode of the television is switched from the current mode to the first priority mode when the first priority mode of the television is triggered. Thus, the television displays the image corresponding to the first priority mode and the convenience in use can be enhanced. In addition, the user needs not to perform any complicated switching operation on the television and the operation mode can be switched to the first priority mode quickly. Thus, the object of enhancing the convenience in use may be achieved in this invention.

More particularly, when the user is a kid who wants to use the video game machine, the kid can start to use the video game machine by only inserting the connector of the video game machine into the television without any switching operation. Thus, the adult does not have to assist the kid in performing the complicated switching operation and the kid can start to use the video game machine easily. Meanwhile, it is also possible to prevent the kid from damaging the television when the kids incorrectly operate the television.

While the invention has been described by way of example and in terms of a preferred embodiment, it is to be understood that the invention is not limited thereto. On the contrary, it is intended to cover various modifications and similar arrangements and procedures, and the scope of the appended claims therefore should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements and procedures.

What is claimed is:

1. A television capable to be operated in a plurality of operation modes comprising a first priority mode, the television connected to a plurality of signal sources, the television comprising:

a screen;

a plurality of input ports for respectively connecting to the plurality of signal sources, one of the input ports being corresponding to the first priority mode;

a detecting circuit for detecting whether a first signal is received at an input port, and detecting whether the input port at which the first signal is received is corresponding to the first priority mode, wherein when the first signal is received at the input port corresponding to the first priority mode, the television is triggered to operate in the first priority mode; and

a processor for displaying the first signal on the screen when the television is in the first priority mode;

wherein when the first priority mode of the television is not triggered, and the television is in one of the other operation modes, the processor displays a second signal corresponding to one of the other operation modes on the screen.

2. The television according to claim **1**, wherein the first priority mode is the game mode for receiving the first signal from a game machine.

3. The television according to claim **1**, wherein the operation modes further comprise a standby mode, and the television further comprises a standby power circuit for supplying

a standby power to the detecting circuit and the processor when the television is in the standby mode.

4. A method of controlling a display device selectively displaying one of a first signal received from a first signal source and a second signal received from a second signal source, the method comprising the steps of:

displaying the second signal when the display device is operated in a current mode of the display device;

detecting whether the first signal is received at an input port of the display device, and detecting whether the input port is corresponding to a first priority mode of the display device; and

displaying the first signal when the first signal is received at the input port corresponding to the first priority mode by the display device;

wherein the display device is capable to be operated in the first priority mode, a television (TV) mode or an audio-video (AV) mode, the display device receives a television signal from a television signal source, and receives an video signal from an audio-video (AV) signal source, the display device displays the television signal when the display device is operated in the TV mode, the display device displays the video signal when the display device is operated in the AV operation mode, the display device detects whether the first signal is received by the display device; and the display device is triggered to be operated in the first priority mode and displays the first signal when the first signal is received by the display device.

5. The method according to claim **4**, further comprising the steps of:

continuously displaying the second signal when the first signal is not received by the display device.

6. The method according to claim **5**, wherein the first signal source is a video game machine, the first signal is a video signal after the video game machine is turned on, the second signal source is the television signal source, and the second signal is the television signal.

7. A display device, comprising:

a screen;

a first input port for receiving a first signal from a first signal source;

a second input port for receiving a second signal from a second signal source;

a detecting circuit for detecting whether the first signal is presented at the first input port, and detecting whether the first input port is corresponding to a first priority mode of the display device; and

a processor for selectively controlling one of the first signal and the second signal to be displayed on the screen;

wherein when the detecting circuit determines the first signal is presented at the first input port and determines the first input port is corresponding to the first priority mode of the display device, the processor displays the first signal on the screen; and

when the detecting circuit determines the first signal is absent from the first input port or determines the first input port is not corresponding to the first priority mode of the display device, the processor displays the second signal on the screen.

8. The display device according to claim **7**, wherein the first signal source is a video game machine, the first signal is received after the video game machine is turned on.

9. The display device according to claim **8**, wherein the second signal source is an audio-video (AV) equipment, the second signal comprising an audio-video signal, and the processor displays the audio-video signal on the screen when the video game machine is off.

10. The display device according to claim **7**, wherein the input ports receive a television signal from a television signal source, and receive a video signal from an audio-video (AV) signal source, the processor displays the television signal on the screen when the display device is set in a TV mode and the detecting circuit determines the first signal is not received, and the processor displays the video signal on the screen when the display device is set in an AV operation mode and the detecting circuit determines the first signal is not received.

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